

Zero Emission Bus Regulation

Public Workshop
May 20 & 21, 2009
California Air Resources Board

Gerhard Achtelik
Craig Duehring
Anna Gromis
Presenting



1

Today's Agenda

- Overview
- Regulatory History
- Current Requirements
- Demonstration Update
- Technology Updates
- Options Moving Forward
- Timeline



2

Overview



- Purpose of Workshop - Today
 - Review status of ZBus technology
 - Staff will provide concepts for next steps
 - Collect information and ideas for taking ZBus regulation forward
- Next Steps
 - July 25, 2009 Board Meeting (San Diego); Staff to provide technology update, recommended actions, and request guidance for ZBus policy
 - Start formal regulatory process using the Board's directive as a guide

3

Zero Emission Bus (ZBus) Regulation History



- Adopted in 2000 Transit Fleet Rule
 - Modified 2 times (2004 and 2006)
- ZBus: Battery Electric, Fuel Cell, or Electric Trolley
- 15% purchase requirement for Transit Agencies (TA) > 200 Buses
- Initial demonstration for large diesel TAs
 - VTA (3 buses, completed)
 - AC Transit (3 buses, on-going)
- Fuel Cell Buses were most viable option

4

Current Regulation (2006 Modifications)



- Diesel TAs must participate in Advanced Demonstration
 - 5 Bay Area TAs participating in 12 bus demonstration (to commence this year)
- Diesel TA purchase requirement: 2011
- Alternative fuel TA purchase requirement: 2012
- Report to the Board in July 2009 with purchase requirement update

5

Current Technology Costs



Technology	Cost
2010 compliant diesel	\$380,000
CNG	\$490,000
Diesel Hybrid Electric	\$560,000
CNG Hybrid Electric	\$1,000,000 (prototype)
Battery Electric	\$1,200,000
Fuel Cell Electric	\$2,200,000

6

Demonstration Status



- VTA Demonstration now finished
 - 3 fuel cell only buses
 - High fuel cost
 - Poor overall efficiency & performance
- AC Transit Demonstration
 - 3 hybrid fuel cell buses have operated for over **40,000** hours
 - Twice the efficiency of diesel buses
 - Positive public acceptance
 - Improved reliability (compared to VTA)

7

Demonstration Data



AC Transit Demo

- 61% Availability
- 6.97 MPG DGE
- 1,395 MBRC



SunLine Transit Demo

- 65% Available
- 8.33 MPG DGE
- 1,194 MBRC

8

US Efforts



- Sunline Transit – 1 fuel cell bus
- South Carolina – 1 battery dominant fuel cell bus
- Connecticut – 3 fuel cell buses
- City of Burbank – 1 battery dominant fuel cell bus (fall 2009)
- Foothill Transit – 3 battery buses (2010)
- AC Transit – 12 fuel cell buses (all delivered by June 2010)

9

Worldwide Efforts



Ongoing

- Brazil – 2 fuel cell buses
- Chinese – 6 fuel cell buses
- Hamburg – 9 fuel cell buses
- Amsterdam – 2 articulated fuel cell buses
- Brussels – 1 fuel cell bus

Planned

- London – 10 fuel cell buses (under construction 2010)
- Vancouver – 20 fuel cell buses (under construction 2010 Olympics)
- Hamburg – 30 fuel cell buses (2011 in planning)

10

Technology Provider Updates



11

Issues for Implementing Regulation



- The regulation cannot be implemented as it is currently written
- Technology still in development
 - Reliability
 - Durability
- Very little new information – Demonstration 18 months behind
- TAs are underfunded

12

Guiding Principles



- ZBus commercialization is necessary in meeting California's criteria pollutant and GHG emission reduction goals
- ZBus regulation is still needed to help develop and commercialize technology
- Transit agencies must be able to cost effectively replace a diesel or CNG bus with a zero emission bus
- ZBuses take California beyond the 2010 fleet rule standard

13

Workshop Topics



1. Purchase requirement delay
2. Purchase requirement alignment
3. Performance Trigger
4. Mitigation (if delayed)
5. Transit GHG reductions

14

Topic 1: Purchase Requirement Delay



- 2011/2012 purchase requirement dates not feasible
- What would be the new purchase requirement date?
- If delayed, mitigation is needed
 - Timing of any mitigation plays into choosing new date for the purchase requirement
- Would extend current Advanced Demo dates

15

Topic 2: Purchase Requirement Alignment



- Currently:
 - Diesel Path: 2011 purchase requirement
 - Alternative Path: 2012 purchase requirement
- 2010 engine standard: all TAs at same criteria pollutant emissions level
- New purchase requirement date would be the same for both fuel paths

16

Topic 3: Performance Trigger



- In 2006, staff proposed that performance requirements be linked to implementation of the purchase requirement, the Board did not approve
 - Currently located in Resolution 06-28

	Implementation Criteria
Purchase Cost (FCB vs. Electric Trolley)	1.25:1
Durability/Warranty	20,000 hours
Reliability (MBRC)	10,000 miles

- Staff would like to propose this mechanism again

17

Topic 4: Mitigation (if delayed)



- If the purchase requirement is delayed, mitigation will be needed
- Considerations
 - Additional demonstration?
 - Phase-in of purchase requirement?
- Timing

18

Topic 5: Long Term Goals Transit GHG Reductions



- Transportation = 38% of contribution to GHG in California
 - 24% = Heavy Duty Vehicles
- Consideration:
Cap on GHG Emissions from Transit
 - Could reward increased ridership
 - Could include:
 - light rail
 - hybrids
 - Would regulate more than just 15% of fleet

19

Timeline



- June 12: Written Comments Due
- June 26: Meeting Notice Released
- July 23: Update to the Board
(Board Hearing in San Diego)
- Fall 2009: Start Process for Modifying Regulation

20

Contacts



Gerhard Achtelik, Manager

gachteli@arb.ca.gov

916-323-8974

Craig Duehring, Staff

cduehring@arb.ca.gov

916-323-2361

Anna Gromis, Staff

acgromis@arb.ca.gov

916-323-2410

21